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SUGAR-CANE VARIETY TESTS IN LOUISIANA DURING THE CROP YEAR 1926–27

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INTRODUCTION

This report summarizes the results of the second season's comparative plot tests with mosaic-tolerant sugar canes in Louisiana. Most of the tests were conducted at the United States Sugar-Plant Field Station on Southdown plantation near Houma, La., and the others on the P. R. Landry plantation near Lafayette, La.

The results of the first season's tests, together with an outline of the scope of the project, have been presented in an earlier publication.[1] It was demonstrated that the three P. O. J. varieties (Nos. 36, 213, and 234) thus far released for general distribution in the State were superior to the commonly grown canes, and that P. O. J. 213 particularly showed outstanding promise of rehabilitating the industry. The results reported here, both from the stubble crops of the original tests and from the new comparisons of plant cane, fully justify that conclusion. Furthermore, the excellent performance of these varieties in widespread commercial plantings in 1927 has finally converted even the most skeptical of the planters to their merits and their value to the industry. With the cultivation of these canes exclusively on some 135,000 acres for the 1927–28 crop, rapid restoration of the industry is expected.

Along with the general acceptance of the new varieties it is gratifying to note a spirit of optimism and cooperation and a renewal of interest in practically all phases of sugar production. Experimental studies on various field operations are now being requested, and aside from the problems that have naturally arisen as a result of the adoption of a different type of cane there is a commendable inclination on the part of the planters to question the efficiency of some of the most time-honored agricultural practices. The increasing use of tractors for land preparation, the partial adoption of the contract or task basis in the hiring of labor, and the extensive purchase of cane on its sucrose content are outstanding developments of the last year.

[1] Rands, R. D., and Sherwood, S. F. YIELD TESTS OF DISEASE-RESISTANT SUGAR CANES IN LOUISIANA. U. S. Dept. Agr. Circ. 418, 20 p., illus. 1927.

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SEASONAL CONDITIONS

The crop year 1926–27 was unusually favorable for the growth and ripening of sugar cane. Whereas the average period between killing frosts in the Louisiana sugar district is only about 9 months, that of 1927 in most sections extended to about 10½ months. Neither figure, of course, represents the actual growing season, because it does not include the time for germination and development of the young plants within the soil prior to the beginning of this frost-free period. The winter of 1926–27 was unusually propitious for this preseasonal growth because of its higher temperatures and lighter rainfall.

In the Houma locality, which was typical of most of the district, fortunately no killing frost occurred between January 21 and December 5, 1927. Temperature and rainfall were favorable to the almost continuous development of the crop during this period. An exception occurred in the case of the Lafayette locality, which experienced the usual March freeze. This, as shown later, caused serious permanent damage to the P. O. J. 234 stubbles, which had responded to the unseasonably warm January and February weather.

VARIETY TESTS AT THE UNITED STATES SUGAR-PLANT FIELD STATION, HOUMA, LA.

TESTS OF RECENTLY IMPORTED VARIETIES

A large collection of imported varieties, including many of the old standard canes formerly grown extensively in other sugar countries, is gradually being assembled and tested on the various soil types for the purpose of determining their local reaction to diseases, their suitability for hybridization, and their adaptability for direct commercial planting in Louisiana. On the last point most of them are naturally disqualified because of too great susceptibility to disease or more frequently because of late maturity. Although certain of the P. O. J. numbers, which are considered later, are proving far superior to the old varieties commonly grown in Louisiana and are restoring the cane-sugar industry to a profitable basis, they also have serious defects, which make desirable the introduction or breeding of better types. In fact, the peculiar requirements of the local industry demand the breeding of varieties suited to its special conditions, as explained in earlier publications of this department.

Table 1 gives laboratory-mill juice analyses of a number of imported varieties that were not included in the plot tests reported in other portions of this circular. The varieties were grown at the United States Sugar-Plant Field Station on Southdown plantation, near Houma, La., in short single-row comparisons, cultivated and treated like the regular fields at the station. All received an early application of mixed commercial fertilizer, containing 12 per cent nitrogen, 4 per cent phosphoric acid, and 4 per cent potash, at the rate of 400 pounds to the acre. The analysis figures, which are based on samples of three to six complete stools of cane, are considered reasonably reliable and comparable, although unequal borer damage to the different varieties introduces some error. Juice extraction by the small power mill used at the station averaged 61 per cent.

By reference to the analyses for Louisiana Purple and P. O. J. 234, included as controls, some idea of the relative earliness of the

varieties may be gained. However, borer damage apparently caused subnormal figures for Louisiana Purple and probably also for Co. 281.

From the standpoint of direct commercial utilization in Louisiana, Co. 281, on account of its erect habit and prolific growth, is probably the most promising variety in this entire list. Several additional varieties of the same series, which have revolutionized the cane industry of northern India, will soon be available for trial in Louisiana. Co. 214 has already been tested for two years. Although it possesses the requisite earliness, it is low in tonnage, has a very small barrel, and has thus far completely failed to ratoon.

TABLE 1.—*Analytical data for 1927 on some imported varieties of sugar cane planted in short-row tests, United States Sugar-Plant Field Station, Houma, La.*

Variety [1]	Age	Soil type	Juice analyses			
			Date	Brix (17.5° C.)	Polarization	Purity
B. H. 10–12	Spring plant	Light	Nov. 17	14.15	10.22	72.2
Co. 214	Fall plant	do	Nov. 7	17.65	14.42	81.7
			Nov. 17	18.50	15.45	83.5
Co. 281	Spring plant	do	Nov. 7	15.20	11.50	75.7
			Nov. 17	14.45	10.60	73.3
Crystalina	First stubble	do	Oct. 21	14.20	10.48	73.8
Cuba 35	do	do	Nov. 7	15.05	11.34	75.3
			Nov. 14	13.40	9.57	71.4
C. H. 64/21	do	do	Oct. 31	15.95	12.26	76.9
D–1135	Second stubble	do	do	13.55	9.84	72.6
		Heavy	Oct. 28	13.30	9.92	74.6
D. I. 52	First stubble	Light	Oct. 31	17.20	14.22	82.7
Java unknown	do	do	do	15.40	10.98	71.3
Kassoer	Second stubble	do	do	12.25	7.70	62.9
		Heavy	Oct. 28	11.75	7.52	64.0
Kavangire	do	Light	Oct. 31	15.85	12.35	77.9
Kinar	First stubble	Heavy	Oct. 28	14.95	11.29	75.5
		Light	Oct. 31	17.25	14.07	81.6
La. Purple (control)	do	do	do	14.70	11.09	75.4
Manjav	do	do	do	14.60	11.28	77.3
P. O. J. 100	do	do	do	14.95	10.68	71.4
P. O. J. 139	do	do	do	15.80	12.45	78.8
P. O. J. 1228	Second stubble	do	do	13.00	8.82	67.8
		Heavy	Oct. 28	13.00	9.56	73.5
P. O. J. 2221	First stubble	Light	Oct. 31	13.90	10.19	73.3
		Heavy	Oct. 28	12.50	8.64	69.1
P. O. J. 2222	do	Light	Oct. 31	15.00	11.39	76.0
		Heavy	Oct. 28	13.55	9.62	71.0
P. O. J. 2354	Fall plant	Light	Oct. 31	15.75	12.80	81.3
	First stubble	do	Nov. 14	16.50	14.03	85.0
P. O. J. 2364	do	do	Oct. 31	12.15	7.46	61.4
			Nov. 15	12.35	8.17	66.2
P. R. 492	do	do	Nov. 7	15.80	12.16	77.0
Shamsara	Spring plant	do	Nov. 17	14.05	10.23	72.8
Spaansch	First stubble	do	Nov. 7	17.15	14.57	85.0
			Nov. 15	17.20	14.99	87.2
Striped Mauritius	Fall plant	do	Oct. 31	14.30	10.54	73.7
Striped S. C. 12/4	First stubble	do	Nov. 14	13.45	9.82	73.0
S. W. 3	Fall plant	Heavy	Oct. 28	12.50	8.20	65.6
Tjipiring 24	First stubble	Light	Oct. 31	14.95	11.09	74.2
Toledo	do	do	do	14.50	9.98	68.8
			Nov. 15	14.90	9.22	61.9
Tucuman 439	do	do	Oct. 31	13.35	9.10	68.2
Tucuman 447	do	do	do	12.15	7.90	65.0
Tucuman 452	do	do	do	11.45	7.23	63.1
Tucuman 507	do	do	do	13.15	8.94	68.0
Tucuman 551	do	do	do	10.60	5.62	53.0
Uba del Cubano	do	do	do	13.85	9.86	71.2
			Nov. 14	14.75	11.06	75.0
P. O. J. 234 (control)	Fall plant	do	Nov. 7	17.40	14.68	84.4
		Heavy	do	17.15	14.54	84.8

[1] Many varieties of sugar cane are commonly designated by letters or other abbreviations indicating the origin of the seedling cane. The meanings of such designations throughout this circular are as follows: B. H.=Barbados Hybrid; C. H.=Cuba Hybrid; Co.=Coimbatore seedling; C. P.=Canal Point seedling; D=Demerara seedling; D. I.=Demak Idjo (Java) seedling; F. M.=Formosa Male seedling; La. Purple=Louisiana Purple; 36–M=Mingka selection of P. O. J. 36; P. R.=Porto Rico seedling; P. O. J.= Proefstation Oost Java seedling; S. C. 12/4=Santa Cruz (classed with St. Croix seedlings); S. W.=Sempal Wadak (Java) seedling; U. S.=United States Department of Agriculture, best selections from Canal Point seedlings.

TESTS OF C. P. AND U. S. SEEDLINGS

Approximately 7,500 new seedlings were produced during the winter of 1926–27 by B. A. Bourne, the cane breeder at the Canal Point (Fla.) station of the Office of Sugar Plants. About 500 selections from this series have already been planted in Louisiana. Testing has been continued on several hundred seedlings of the earlier series produced at Canal Point by the late Peter J. Klaphaak. Some yields and juice analyses of the 1926 selections are now published. Results of a comparative test of 21 seedling[2] varieties are presented in Table 2. The test was planted in the third "cut" from the bayou in typical black, sticky, clay soil, thousands of acres of which have been abandoned in recent years as unprofitable for cultivation of the old varieties. Following the last preceding cane crop, soy beans had been plowed under for two years, and the test itself was given a spring application of the fertilizer mixture already described, at the rate of 400 pounds per acre. With the exception of P. O. J. 234, used as a control, only enough seed was available to plant a single sixtieth-acre plot of each variety, but practically perfect stands were obtained, so that the results enable preliminary judgment of yielding capacity.

TABLE 2.—*Results of preliminary tests of some C. P. and U. S. seedling varieties of sugar cane in "black land," United States Sugar-Plant Field Station, Houma, La.*

[Planted November 30, 1926, in single sixtieth-acre plots; harvested November 17, 1927]

Variety	Calculated acre-yield (tons) [a]	Laboratory-mill juice analyses [b]			Fiber in cane [c] (per cent)	Indicated available 96° sugar [d]		Tons of cane for 1 ton of sugar [a]
		Brix (17.5° C.)	Polarization	Purity		Pounds per ton of cane [a]	Pounds per acre	
C. P. 21	29.3	16.75	12.82	76.6	----------	164.4	4,817	12.2
C. P. 40	31.2	16.25	12.36	76.1	----------	158.0	4,930	12.7
C. P. 47	23.0	16.90	13.81	81.7	----------	184.4	4,241	10.8
C. P. 49	16.8	14.20	10.06	70.8	----------	122.6	2,060	16.3
C. P. 67	32.2	15.60	11.73	75.2	----------	148.7	4,788	13.4
C. P. 71–B	[e] 28.4	16.05	12.24	76.3	15.00	156.6	4,447	12.8
C. P. 75	31.5	15.35	11.84	77.1	----------	152.5	4,804	13.1
C. P. 108	29.6	13.20	8.82	66.8	----------	102.7	3,040	19.5
C. P. 123	27.0	14.90	11.19	75.1	14.25	141.8	3,829	14.1
C. P. 177	37.3	15.50	11.40	73.5	16.95	142.5	5,315	14.0
C. P. 324	30.6	15.00	11.14	74.3	----------	140.2	4,290	14.3
C. P. 803	32.6	12.90	8.35	64.7	----------	94.7	3,087	21.1
C. P. 807	39.9	15.25	12.15	79.7	16.05	159.7	6,372	12.5
C. P. 808	26.0	12.15	7.76	63.9	----------	87.1	2,265	23.0
C. P. 827	37.1	13.20	9.20	69.7	----------	110.7	4,107	18.1
C. P. 831	28.1	13.30	9.27	69.7	----------	111.6	3,136	17.9
U. S. 826	18.7	14.80	9.21	62.2	----------	100.9	1,887	19.8
U. S. 1387	34.5	13.60	9.32	68.5	----------	110.7	3,819	18.1
U. S. 1419	26.0	11.40	7.30	64.0	----------	82.1	2,135	24.4
U. S. 1437	37.1	13.45	8.85	65.8	----------	101.8	3,777	19.6
U. S. 1444	32.2	15.95	11.76	73.7	----------	147.2	4,740	13.6
P. O. J. 234 (control) [f]	28.0	15.93	12.67	79.5	14.18	166.6	4,665	12.0

[a] Tons of 2,000 pounds.
[b] Nov. 7, 1927.
[c] Analysis of one 5-stalk sample.
[d] Method of calculation similar to that described in RANDS, R. D., and SHERWOOD, S. F. Op. cit., p. 5–6; 78 per cent juice normal extraction and boiling-house efficiency of 100 per cent are assumed.
[e] Average of 2 plots.
[f] Average of 4 plots scattered among the seedling varieties.

[2] The writers are indebted to W. G. Taggert, of the Louisiana Agricultural Experiment Station, for the seed supply of U. S. 826, 1387, 1419, and 1444.

As will be noted from Table 2, some exceptionally high tonnage yields were obtained. Both the juice analyses and yields of a number of the seedlings compare favorably with those of P. O. J. 234, and the type and growth of the canes are sufficiently desirable to warrant the further testing and increase of the seed supply in replicated plot experiments, which is being done. The most promising as plant cane are probably C. P. 177 and C. P. 807. Both came up in the spring as early as or earlier than P. O. J. 234. Neither has shown mosaic symptoms during the two years they have been grown at the station. Their stalks approximate those of P. O. J. 36 in size, strip easily, and have about the same fiber content, but both show a higher percentage of lodging. C. P. 807 particularly has an objectionable bird's-nest type of stool, which, however, does not become pronounced until after the lay-by cultivation and therefore is not a hindrance to ordinary tillage. C. P. 177 is a cross between Kassoer and F. M. 3, a Formosan variety, while C. P. 807 is a seedling of U. S. 1643, which in turn is a seedling of P. O. J. 213.

The U. S. varieties in this test, with the exception of U. S. 1444, show but little promise of ability to compete with the P. O. J. varieties. U. S. 1444 (a seedling of P. O. J. 213) is very backward in the early stages of its growth, but later it develops rapidly and, unlike many of this series, strips very easily. Results from five additional varieties (U. S. 601, 663, 1436, 1687, and 1703) selected in 1925 or earlier and planted in replicated plot tests in 1926 are presented in subsequent tables.

TESTS OF STUBBLE CANE

Comparative plot tests of nine P. O. J. varieties originally planted in the fall of 1925, and partially reported upon as plant cane in 1926,[3] were continued during the first-stubble crop in 1927. As explained in the circular referred to, severe borer damage and scarcity of seed of most of these varieties in 1925, combined with injury from the hurricane of August 25, 1926, prevented reliable comparisons of all but four varieties (P. O. J. 36, 213, 234, and 826), which alone showed fairly uniform stands and development. The same may also be said for the resulting stubbles, as no replanting was done. However, the stubble plots of P. O. J. 234 came up poorly and showed much thinner stands than those of the other three varieties. This was apparently, for the most part, an indirect result of the hurricane, as the plant cane had been harvested late and the season was not unfavorable. It was noted that, where stools had been turned over and had sprouted extensively from the soil before harvest in 1926, no further sprouting occurred in the spring. Thus the sprouting of eyes in the early fall, which should normally take place in the spring, weakened not only the partially uprooted mother stools but also the young plants, which failed to become sufficiently established to withstand the winter. This condition was not noted outside the path of the storm, although in the Lafayette section the same result was brought about by the sprouting of the stubbles during abnormally warm weather in January and February, followed by a freeze in March.

The plots began germinating in January, and in the absence of spring frosts were soon too far advanced to permit shaving the stubbles without danger of damaging the new crop. They were accordingly

[3] RANDS, R. D., and SHERWOOD, S. F. Op. cit., p. 18.

hoed, harrowed, offbarred, and fertilized in early March with 400 pounds to the acre of the mixture already described. As the season progressed borer infestation became general and resulted in appreciable damage, in spite of three dustings with sodium fluosilicate during August and September. As noted during the two previous years, P. O. J. 213 suffered most; this experience indicates that as long as borers are at all common no very accurate figures may be obtained on the relative yielding capacity of this variety. Even in years of low infestation (such as 1924) the small plots, which are necessary for accurate comparison of varieties, attract the moths from surrounding areas and suffer disproportionately. Fortunately, the performance of this cane is outstanding, in spite of this hindrance to its growth. The reason is undoubtedy the absence of much discoloration extending from the tunnels and correspondingly less inversion, or destruction of sucrose, than in the old varieties.

The results are presented in Table 3, which is comparable to the table published under the same number in Department Circular 418 [4] giving the data for plant cane from the same plots. A number of light-soil plots planted in the spring of 1926, which could not be included with the fall-planted cane in Table 2, are averaged in Table 3. Tonnage data are given for only P. O. J. 36, 213, 234, and 826, but analyses are presented for all. The latter are considered comparable and fairly reliable, because the samples were taken only from portions of the plots with uniform stands. However, the harvest analyses of the four above-mentioned varieties are based on an average of seven samples, i. e., one 40 to 50 stalk sample from each plot; whereas in case of P. O. J. 36–M and D–74 (used as a control) there were but two plots and only one each of P. O. J. 228, 2379, 2714, and 2725.

The two uneven plots of P. O. J. 36–M yielded an average of 27.1 tons of cane per acre, and those of D-74, 15 tons. The yields of the single plots of the other varieties were as follows: P. O. J. 228, 15 tons; 2379, 21 tons; 2714, 21 tons; 2725, 23 tons. Considering the gappy stands, the performances of P. O. J. 36–M and 2725, and even of D–74, are somewhat surprising.

By comparing the results in Table 3 with the previous year's data on plant cane,[4] it is seen that all the 1927 yield figures are higher except for the stubble yields of P. O. J. 234, which are abnormally low and probably accounted for by the unusual conditions already discussed. P. O. J. 213 is again the most promising variety, although the preliminary figures place P. O. J. 36–M as a close competitor. P. O. J. 36, 228, 826, and 2714 are again shown to be later maturing types.

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[4] Rands, R. D., and Sherwood, S. F. Op. cit.

TABLE 3.—*Results of tests of sugar-cane varieties (first-stubble cane) on light and heavy soils, United States Sugar-Plant Field Station, Houma, La., 1927*

Soil and variety of cane	Equivalent acre yield of cane (tons)[1]								Laboratory-mill juice analyses		
									Preliminary		
	First plot	Second plot	Third plot	Fourth plot	Fifth plot	Sixth plot	Seventh plot	Average	Oct. 13		
									Brix	Polarization	Purity
On light soil:											
P. O. J. 36	24.6	22.7	29.2	25.8	21.7	25.0	29.0	25.4	13.45	9.25	68.8
P. O. J. 36–M									15.10	11.56	76.6
P. O. J. 213	18.6	17.8	28.6	26.2	24.8	26.2	33.4	25.1	13.75	9.64	70.1
P. O. J. 228									12.70	8.13	64.0
P. O. J. 234	13.5	14.7	15.5	20.4	18.9	17.3	17.6	16.8	15.65	12.31	78.7
P. O. J. 826	23.2	27.1	29.7	25.2	24.4	25.5	21.6	25.2	13.25	8.96	67.6
P. O. J. 2379									13.60	9.31	68.5
P. O. J. 2714									12.45	7.60	61.0
P. O. J. 2725									14.40	10.42	72.4
D–74 (control)									14.35	10.52	73.3
On heavy soil:											
P. O. J. 36	30.4	23.4	28.4	32.7	29.4	32.9	29.7	29.6			
P. O. J. 213	28.8	24.4	22.0	32.1	24.8	31.6	28.7	27.5			
P. O. J. 234	18.0	15.9	18.5	16.1	23.3	22.4	14.9	18.4			
P. O. J. 826				33.9	22.9	35.4	29.4	30.4			

Soil and variety of cane	Laboratory-mill juice analyses—Con.							Fiber in cane[2] (per cent)	Indicated available 96° sugar at harvest[3]		Tons of cane for 1 ton of sugar[1]
	Preliminary—Con.			At harvest (Nov. 27)							
	Oct. 27										
	Brix	Polarization	Purity	Brix	Polarization	Purity	Reducing sugars as invert sugar (per cent)	Acidity[4]		Pounds per ton of cane[1]	Pounds per acre	
On light soil:												
P. O. J. 36	14.25	10.46	73.4	15.84	12.62	79.9	1.09	2.3	15.78	165.8	4,211	12.1
P. O. J. 36–M	15.45	12.20	79.0	16.35	13.30	81.3	.99	2.3	15.58	177.0		11.3
P. O. J. 213	14.60	11.00	75.3	16.43	13.76	83.7	.75	2.5	14.75	186.2	4,674	10.7
P. O. J. 228	14.25	10.11	70.9	14.85	11.20	75.4	1.23	2.8	13.50	142.3		14.1
P. O. J. 234	15.40	12.19	79.2	16.49	13.82	83.7	.60	2.5	14.45	186.9	3,140	10.7
P. O. J. 826	14.40	10.36	71.9	15.46	11.88	76.8	1.58	2.6	12.30	152.7	3,848	13.1
P. O. J. 2379	13.35	8.76	66.4	16.90	14.09	83.4			15.60	190.0		10.5
P. O. J. 2714	11.95	6.87	57.5	14.85	10.98	73.9			13.05	137.7		14.5
P. O. J. 2725	14.35	10.36	72.2	16.75	13.64	81.4			12.85	181.7		11.0
D–74 (control)	14.00	10.12	72.3	15.32	12.10	78.9	.93	2.2	10.73	158.3		12.6
On heavy soil:												
P. O. J. 36	14.95	11.11	74.1	16.33	13.43	82.2	1.05	2.5	14.98	180.0	5,328	11.1
P. O. J. 213	15.52	12.23	78.8	17.05	14.83	87.0	.51	2.2	15.13	204.6	5,627	9.8
P. O. J. 234	16.10	12.71	78.9	16.65	13.99	83.9	.49	2.6	14.63	189.5	3,487	10.6
P. O. J. 826	13.95	9.61	68.9	15.45	12.04	77.9	1.10	2.9	14.43	156.3	4,752	12.8

[1] Tons of 2,000 pounds.

[2] Analysis of one or two 5-stalk samples, as outlined in RANDS, R. D., and SHERWOOD, S. F. Op. cit.

[3] Method of calculation similar to that described in RANDS, R. D., and SHERWOOD, S. F. Op. cit., p. 5–6; 78 per cent normal juice extraction and boiling-house efficiency of 100 per cent are assumed

[4] Acidity represented by number of cubic centimeters N/10 NaOH for 10 c. c. of juice; NaOH accurately standardized. Unusually high acidities were encountered in all juice samples throughout the campaign

Another stubble-cane test of so-called sirup-cane varieties is included. In 1925, when little was known of the adaptability of the three P. O. J. varieties 36, 213, and 234 to the heavy soils of the sugar belt, considerable interest was aroused over trials of a cane of the Cayana type, which was being grown at the Southdown plantation for sirup production. This variety had been planted on the heaviest and most poorly drained lands, and its growth and performance under most unfavorable conditions, as compared with those of the old varieties, justified the large-scale plantings that were subsequently made at the Southdown and other plantations.

Because of the uncertain origin and identity of this cane it was desired to compare it with authentic Cayana from Georgia and with as many other similar varieties as possible. Cayana is a representative of a rather large group of closely related varieties, known as the Chinese canes, all of which are characterized by great vigor and resistance or immunity to mosaic and root diseases. Accordingly, in February, 1926, a small quantity of seed of eight varieties of this type, including Cayana, was obtained from the Government sirup station at Cairo, Ga., and planted in the heaviest soil at the United States Sugar-Plant Field Station on Southdown plantation. Two U. S. seedlings (601 and 663) with similar growth habit were also included. In the fall of 1926, G. B. Sartoris, associate pathologist, Office of Sugar Plants, made juice analyses and experimental lots of sirup from each variety in the small open pan used for control purposes at the Southdown factory. The extremely low sucrose and high acidity of practically all these varieties as compared with those of P. O. J. 213 and 234 in similar tests discouraged further interest in the experiment, especially as the more desirable P. O. J. canes were doing so well under the same conditions.

The stubbles were preserved, and with the favorable season of 1927 more nearly representative results were obtained, as shown in Table 4. However, on comparison of these figures with the data for heavy soils in Table 3, which gives the results on P. O. J. stubbles from an adjacent cut, the relative lateness in ripening and other disadvantages of these varieties are again indicated. No further sirup tests were made for the reason that the local industry, in order to take advantage of market fluctuations, demands a variety that is satisfactory for both sugar and sirup production, and it is not believed that any of these canes can compete with P. O. J. 213 in this dual rôle.

TESTS OF PLANT CANE ON HEAVY SOIL

Special attention is being given to the testing of varieties on the heavy, impacted, poorly drained soils, which have been variously estimated to constitute 30 to 40 per cent of the arable lands of the sugar belt. This involves, first, the determination, study, and evaluation of the various factors that combine to bring about the condition known locally as root disease; and, second, the study of the possible influence of such conditions on the germination, growth, and ratooning ability of all varieties that show promise of commercial utilization in Louisiana. While these related studies will eventually form the basis of a separate report, it may be stated now that most of the varieties thus far tested on these soils show more or less root mortality and that the difference as compared with D–74 is apparently largely a matter of degree.

TABLE 4.—*Results of preliminary tests of some Chinese canes and seedling varieties (first stubbles) on heavy soil, United States Sugar-Plant Field Station, Houma, La., 1927*

Variety	Calculated acre yield of cane (tons) [1]			Laboratory-mill juice analyses						Available 96° sugar at harvest [2]		Tons of cane for 1 ton of sugar [1]
				Preliminary (Oct. 28)			At harvest (Nov. 30)					
	First plot	Second plot	Average	Brix	Polarization	Purity	Brix	Polarization	Purity	Pounds per ton [1] of cane	Pounds per acre	
Cayana, Ga.	16.2	26.0	21.1	15.95	12.66	79.4	15.78	12.54	79.5	164.6	3,473	12.2
Cayana (Southdown)	19.0	20.7	19.9	16.35	13.25	81.0	16.28	13.11	80.5	173.4	3,451	11.5
Chikucha	23.1	17.8	20.5	14.15	10.23	72.3	16.30	13.09	80.3	172.8	3,542	11.6
Khera	18.4	18.3	18.4	15.35	11.73	76.4	16.00	12.69	79.2	166.3	3,060	12.0
Kikaigashima	19.6	13.7	16.7				15.53	12.23	78.8	159.6	2,665	12.5
Merthi	17.2	22.0	19.6	12.85	8.68	67.5	14.63	10.84	74.1	136.1	2,668	14.7
Oshima	26.1	25.0	25.6	13.05	9.17	70.3	14.43	10.69	74.1	134.2	3,436	14.9
Tekcha	19.9	17.8	18.9	14.15	10.16	71.8	15.65	12.17	77.7	157.8	2,982	12.7
U. S. 601	26.1	21.9	24.0	12.05	7.88	65.4	14.10	9.98	70.7	121.4	2,914	16.5
U. S. 663	30.5	23.0	26.8	13.70	9.90	72.3	15.90	12.41	78.1	161.3	4,323	12.4

[1] Tons of 2,000 pounds.

[2] Method of calculation similar to that described in RANDS, R. D., and SHERWOOD, S. F. Op. cit., pp. 5–6; 78 per cent normal juice extraction and boiling-house efficiency of 100 per cent are assumed.

A comparative test with some C. P. and U. S. seedling varieties and a stubble test with P. O. J. canes on this general soil type have already been reported. (Tables 2 and 3.) A further test comparing 10 varieties as plant cane was laid down November 27, 1926, in the heavy soil area of the United States Sugar-Plant Field Station. This soil is typical of what is known throughout the sugar district as "black land" or "buckshot," the latter referring to its pebbly surface appearance after a period of weathering.

Following the last preceding cane crop the land had been rested for two years by being planted to Biloxi soy beans, which were turned under. Because of frequent local rains during August and September, 1926, timely preparation of the land for planting was impossible. The soy beans, turned under in late September, had become very large and woody, and the continued decay of this mass of detritus through the early spring months had a pronounced retarding effect on the crop, due presumably to temporary deficiency of available nitrogen, brought about by the demands of the cellulose-destroying soil organisms. Excess rainfall during June was doubtless a contributing factor in retarding growth on such heavy soil.

The varieties were divided into two groups of five each, and each cane was planted in fortieth-acre plots repeated five times and distributed in checkerboard fashion over the area. Each group was confined to a single "cut" or square and was bordered along the ditches by one or more rows of P. O. J. 213. No commercial fertilizer was used.

The results, presented in Table 5, show some rather disappointing tonnage yields, which are believed to have been largely due to the late preparation of the seed bed. Group 1 as a whole produced better than Group 2, apparently in part because of local soil variations. The fifth plot in each case was nearest a large drainage ditch, and the effect of the better drainage and possibly slightly greater fertility of

the soil is evident in the yields. Individual plot figures are too variable to allow much confidence to be placed in the differences between the average yields. U. S. 1703 and P. O. J. 2379, however, are seen to be definitely inferior under the conditions of the test.

TABLE 5.—*Results of tests of sugar-cane varieties (plant cane) on heavy soil, United States Sugar-Plant Field Station, Houma, La., 1927*

Grouping and variety of cane	Equivalent acre yield of cane (tons) [1]						Laboratory-mill juice analyses		
	First plot	Second plot	Third plot	Fourth plot	Fifth plot	Average	Preliminary Nov. 9		
							Brix	Polarization	Purity
Group 1:									
P. O. J. 213	22.8	18.6	26.1	27.6	27.3	24.5	14.60	11.24	77.0
P. O. J. 2725	----	27.4	18.7	26.6	27.2	25.0	16.50	13.35	80.9
U. S. 1436	26.0	28.7	23.2	26.1	27.6	26.3	15.55	12.45	80.1
U. S. 1687	26.3	23.8	24.2	31.8	34.5	28.1	15.15	11.56	76.3
U. S. 1703	19.3	19.3	----	----	26.0	21.5	17.10	13.37	78.2
Group 2:									
P. O. J. 36	23.8	18.5	20.5	22.3	30.4	23.1	15.65	12.67	80.9
P. O. J. 36–M	16.1	18.6	18.8	20.7	26.0	20.0	16.35	13.61	83.2
P. O. J. 228	18.4	19.6	17.7	21.5	25.0	20.4	14.15	10.27	72.6
P. O. J. 234	19.9	17.7	19.2	19.5	28.0	20.9	18.20	15.60	85.7
P. O. J. 2379	17.4	11.6	11.2	----	25.3	16.4	15.60	12.52	80.3

Grouping and variety of cane	Laboratory-mill juice analyses—Con. At harvest [2]					Fiber in cane [4] (per cent)	Indicated available 96° sugar at harvest [5]		Tons of cane for 1 ton of sugar [1]
	Brix	Polarization	Purity	Reducing sugars as invert sugars (per cent)	Acidity [3]		Pounds per ton of cane	Pounds per acre	
Group 1:									
P. O. J. 213	15.87	13.39	84.4	0.54	2.2	14.15	181.8	4,454	11.0
P. O. J. 2725	15.35	11.97	78.1	1.63	2.5	13.15	155.3	3,883	12.9
U. S. 1436	15.72	12.85	81.7	.94	2.6	18.70	171.3	4,505	11.7
U. S. 1687	15.85	12.17	76.8	1.43	3.4	20.35	156.5	4,398	12.8
U. S. 1703	17.30	14.00	80.9	.63	3.5	17.60	185.9	3,997	10.8
Group 2:									
P. O. J. 36	15.30	12.42	81.1	.91	2.8	15.35	165.1	3,814	12.1
P. O. J. 36–M	16.05	13.40	83.5	.82	2.4	15.10	180.9	3,618	11.1
P. O. J. 228	14.99	11.60	77.3	1.05	3.0	----	149.8	3,056	13.4
P. O. J. 234	16.68	14.11	84.6	.40	2.8	14.18	191.9	4,011	10.4
P. O. J. 2379	15.44	12.67	82.1	.79	2.1	14.73	169.6	2,781	11.8

[1] Tons of 2,000 pounds.
[2] Group 1 harvested Nov. 19–21; Group 2, Nov. 14 and 15.
[3] Acidity represented by number of cubic centimeters of N/10NaOH per 10 c. c. of juice; NaOH accurately standardized. Unusually high acidities were encountered in all juice samples throughout the tests.
[4] Analysis of one or two 5-stalk samples.
[5] Method of calculation similar to that described in RANDS, R. D., and SHERWOOD, S. F. Op. cit., p. 5–6; 78 per cent normal juice extraction and boiling-house efficiency of 100 per cent are assumed.

In sugar yields per ton P. O. J. 234 naturally leads and is followed by U. S. 1703, P. O. J. 213, P. O. J. 36–M, and U. S. 1436. Heavy rain preceding harvest apparently affected adversely the juices of P. O. J. 2725, which in the preliminary analyses had compared very favorably with others.

P. O. J. 36–M under these special conditions is shown to be definitely weaker in growth than its parent variety, P. O. J. 36. The former is apparently more affected by mosaic, but its outstanding earliness and richer juices have even here practically compensated for the small difference in yield of cane.

The three U. S. varieties, while possessing the requisite earliness, are very high in fiber and have other undesirable qualities that practically eliminate them as serious competitors of the better yielding P. O. J. varieties.

TESTS OF PLANT CANE ON MIXED SOIL

A comparative yield test with 11 varieties was planted November 6, 1926, in typical "mixed" land at the United States Sugar-Plant Field Station. Seed of D–74 and Louisiana Purple, used as controls, were from selected strains kindly furnished by C. W. Edgerton of the Louisiana Agricultural Experiment Station. The test was harvested November 10, 1927, and the results are presented in Table 6.

TABLE 6.—*Results of tests of sugar-cane varieties (plant cane) on "mixed" soils, United States Sugar-Plant Field Station, Houma, La., 1927*

Grouping and variety of cane	Equivalent acre yield of cane (tons) [1]						Laboratory-mill juice analyses			
							At harvest (Nov. 7–11)			
	First plot	Second plot	Third plot	Fourth plot	Fifth plot	Average	Brix	Polarization	Purity	Reducing sugars as invert sugar (per cent)
Group 1:										
P. O. J. 36–M	25.1	22.0	29.1	24.9	24.9	25.2	15.61	12.50	80.1	1.22
P. O. J. 228		26.9	25.6	23.7	21.3	24.4	14.96	11.18	74.7	1.44
P. O. J. 234	24.7	28.9	20.8	23.0	20.3	23.5	17.13	14.08	82.2	.75
P. O. J. 826	19.5					19.5	14.60	10.72	73.4	1.50
P. O. J. 2379	14.5	17.5	17.5	13.9	19.6	16.6	15.06	11.48	76.3	1.12
D–74 (selected)	12.4		12.6		13.6	12.9	16.10	12.85	79.8	1.05
La. Purple (selected)		25.5		20.1		22.8	14.15	10.65	75.3	
Group 2:										
P. O. J. 979	20.7	22.3	18.9	18.2	19.4	19.9	15.67	11.80	75.3	1.70
P. O. J. 2714	20.5	16.2	18.8	9.9	18.9	16.9	14.48	10.11	69.9	1.78
P. O. J. 2725	29.6	27.0	20.9	17.2	18.0	22.5	15.49	11.72	75.7	1.57
P. O. J. 2727	23.4	21.0	21.7	18.4	20.4	21.0	15.22	11.09	72.8	1.79
D–74 (selected)	14.3	13.9	12.7	10.1	5.9	11.4	16.47	13.13	79.7	1.12

Grouping and variety of cane	Laboratory-mill juice analyses—Con.					Indicated available 96° sugar at harvest (Nov. 7–11) [2]		Tons of cane for 1 ton of sugar [1]
	After harvest (Dec. 6)							
	Brix	Polarization	Purity	Reducing sugars as invert sugar (per cent)	Acidity [3]	Pounds per ton of cane	Pounds per acre	
Group 1:								
P. O. J. 36–M	15.70	13.00	82.8	0.88	2.2	164.8	4,153	12.1
P. O. J. 228	14.85	11.40	76.8	1.23	2.8	141.3	3,448	14.2
P. O. J. 234	16.50	14.05	85.2	.46	2.6	188.3	4,425	10.6
P. O. J. 826						133.8	2,609	14.9
P. O. J. 2379	15.30	12.45	81.4	.86	2.0	146.9	2,439	13.6
D–74 (selected)						169.0	2,180	11.8
La. Purple (selected)	14.60	11.40	78.1	1.18	2.0	135.2	3,083	14.8
Group 2:								
P. O. J. 979	15.25	11.80	77.4	1.36	2.2	149.8	2,981	13.4
P. O. J. 2714	15.90	12.20	76.7	1.41	2.6	121.8	2,058	16.4
P. O. J. 2725	16.35	13.25	81.0	1.10	2.2	149.3	3,359	13.4
P. O. J. 2727	16.10	12.10	75.2	1.57	3.0	137.7	2,892	14.5
D–74 (selected)	16.75	13.90	83.0	.64	2.2	172.7	1,969	11.6

[1] Tons of 2,000 pounds.

[2] Method of calculation similar to that described in RANDS, R. D., and SHERWOOD, S. F. Op cit., p 5–6; 78 per cent normal juice extraction and boiling-house efficiency of 100 per cent are assumed.

[3] Acidity represented by number of cubic centimeters of N/10 NaOH per 10 c. c. of juice; NaOH accurately standardized Unusually high acidities were encountered in all juice samples throughout the tests.

Unfortunately, here again relatively low tonnage yields were obtained. As in case of the black-land test just reported, the incorporating in the soil of a heavy soy-bean crop late in the season and the consequently poor seed bed were doubtless responsible for the noticeably backward spring development of the crop compared with adjacent ratoon fields. The varieties of Group 1 were on a light phase of this general soil type and those of Group 2 on heavier soil still farther from the bayou.

It will be noted that P. O. J. 2379, P. O. J. 2714, and D–74 were most seriously retarded by the unfavorable soil conditions. Louisiana Purple developed well, but severe borer infestation accompanied by red rot resulted in abnormally low juice analyses. P. O. J. 234 and P. O. J. 36–M were the outstanding varieties, exceeding D–74 by approximately a ton of sugar per acre. While P. O. J. 228 compared favorably in tonnage, it was again much lower in sugar than these varieties. Of the larger barrel canes, P. O. J. 2725 was again most promising.

VARIETY TEST ON P. R. LANDRY PLANTATION, LAFAYETTE, LA.

A plant-cane test made on the P. R. Landry plantation, near Lafayette, La., comparing four P. O. J. varieties with Louisiana Purple as control, was reported in Department Circular 418.[6] The results from the first-stubble crop from the same plots are now given.

As already mentioned, the Lafayette locality did not share in the unusually long growing season enjoyed by the greater part of the sugar belt during 1927. Nevertheless even here the frost-free period continued in the fall nearly a month longer than the 26-year average. This additional period, however, did not benefit the stubble cane, which was harvested November 8. The frost of March 2 was the important limiting factor. The average date of the last killing frost in the spring at Lafayette is March 4. Therefore the frost of March 2, 1927, while restricted in area, was not unusual as to time. The preseasonal development of the crop on this date was the unusual feature; and as the P. O. J. canes were most advanced, they suffered the greatest damage from the frost. Here, as elsewhere, as a result of unusually dry weather in January and abnormally high temperature during both January and February, the P. O. J. stubbles had sprouted and were well advanced in growth by March 1, while the Louisiana Purple had but slightly responded to these favorable conditions. The former, therefore, suffered a serious setback from the early March cold spell, many stools of P. O. J. 234 dying out and leaving a gappy stand. Had the stubbles been shaved immediately following the frost, the condition might have been improved.

The results are presented in Table 7, where it will be noted that all the yields are low. These are, doubtless, accounted for partly by the withholding of fertilization during both plant and stubble crops.

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[6] RANDS, R. D., and SHERWOOD, S. F. Op. cit., Table 5.

TABLE 7.—*Results of a comparative test of sugar-cane varieties (first-stubble cane) on P. R. Landry plantation, Lafayette, La., 1927*

Variety	Equivalent acre yield of cane (tons)[1]								
	First plot	Second plot	Third plot	Fourth plot	Fifth plot	Sixth plot	Seventh plot	Eighth plot	Average
La. Purple (control)	14.8	13.0	10.6	13.7	9.0	13.0	11.2	15.2	12.6
P. O. J. 36	17.6	-------	24.8	18.1	21.6	12.1	-------	21.3	19.3
P. O. J. 213	14.4	18.6	20.2	18.3	21.5	14.0	19.6	17.6	18.0
P. O. J. 234	8.2	14.5	14.2	14.0	12.0	12.9	12.4	11.6	12.5
P. O. J. 826	-------	20.6	17.4	18.9	17.2	-------	18.6	17.1	18.3

Variety	Laboratory-mill juice analyses								Fiber in cane[2] (per cent)	Indicated available 96° sugar at harvest (Nov. 8)[3]		Tons of cane for 1 ton of sugar[1]
	Preliminary (Oct. 22)					At harvest (Nov. 8)						
	Brix	Polarization	Purity	Reducing sugars as invert sugar (per cent)	Acidity	Brix	Polarization	Purity		Pounds per ton of cane	Pounds per acre	
La. Purple (control)	14.75	10.90	73.9	2.32	1.00	16.45	13.42	81.6	11.00	179.0	2,255	11.2
P. O. J. 36	13.90	9.90	71.2	2.32	1.20	16.15	12.39	76.7	13.90	159.1	3,071	12.6
P. O. J. 213	15.75	12.55	79.7	1.51	1.60	16.35	13.15	80.4	16.40	173.8	3,128	11.5
P. O. J. 234	15.55	12.10	77.8	1.69	1.40	16.00	12.64	79.0	14.70	165.4	2,068	12.1
P. O. J. 826	15.00	11.10	74.0	2.20	1.40	16.50	13.03	79.0	11.90	170.5	3,120	11.7

[1] Tons of 2,000 pounds.
[2] Analysis of one 5-stalk sample.
[3] Method of calculation similar to that described in RANDS, R. D,. and SHERWOOD, S. F. Op. cit., p. 5–6; 78 per cent normal juice extraction and boiling-house efficiency of 100 per cent are assumed.

Largely because of the conditions just mentioned, P. O. J. 234 yielded no more than Louisiana Purple, but in spite of the spring setback the other three P. O. J. varieties exceeded the Purple by 5 to 7 tons of cane and nearly one-half ton of sugar per acre. Therefore, considering both years' results, the superiority of the P. O. J. varieties under the conditions of this test is amply demonstrated.

DISCUSSION AND SUMMARY

The results of the 1927 variety tests again support the original recommendation of 1924 by the United States Department of Agriculture urging the planters to adopt P. O. J. 36, 213, and 234 as the surest means for relieving the distressing financial condition of the industry. Extensive plantings and comparisons by the growers themselves have finally eliminated all doubt as to the superiority of these canes over the old varieties.

As regards the relative merits of the three released P. O. J. canes themselves, the tests conducted in 1927 by the department, considering all circumstances, again reveal P. O. J. 213 as the most promising

variety. Because of the unusually long growing season, P. O. J. 36 was a close competitor, and P. O. J. 234 ranked as a possible third. However, as stated in earlier publications, it is not believed that for the average growing season P. O. J. 36 will compete with P. O. J. 213, except in a few localities having a frost-free period two to four weeks longer than the average, or where an equal ripening effect is obtained because of low autumn rainfall or unusual soil drainage. It is apparently also a harder cane to mill. Therefore, until more comparative information covering a period of years has accumulated, the policy of confining P. O. J. 36 to a relatively small proportion of the plantings is probably justified.

P. O. J. 234 has proved to be inferior to the other two varieties in stubbling or ratooning ability, as was anticipated from the experience with this cane in other countries. It is definitely more susceptible to root rot and other deteriorating soil factors. To what extent its earliness may compensate such disadvantages, experience alone will determine.

Preliminary tests on more recently introduced and as yet unreleased varieties indicate promising possibilities for P. O. J. 36–M and P. O. J. 2725. P. O. J. 36–M has most of the desirable qualities of P. O. J. 36 and matures much earlier. If such apparent advantages are maintained in further tests, it may be expected eventually to displace the parent cane, as well as much of the acreage devoted to P. O. J. 234, and possibly also some of that of P. O. J. 213. It is apparently more affected by mosaic than P. O. J. 36 and P. O. J. 213 and may prove to be a weaker ratooner, although during 1927 at the station a short row of second-year stubble grew very satisfactorily.

P. O. J. 2725, while promising from the standpoint of earliness, size of barrel, and ease of harvesting, has a number of serious disadvantages. These are principally: (1) Large quantity of seed required for planting; (2) an undesirable recumbent type of growth, interfering with tillage; and (3) late closing in, necessitating prolonged cultivation and weeding.

Several of the C. P. seedling varieties compared very favorably in a single test with P. O. J. 234, in one case exceeding this variety by nearly a ton of sugar per acre.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

July 16, 1928

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